Impulse - Momentum Theorem:

Impulse = Momentum

$\Delta t = t_f - t_i$

$$\bar{F}\Delta t = m\Delta\bar{v}$$

$$\bar{F} = m\left(\frac{\Delta\bar{v}}{\Delta t}\right) \qquad \bar{a} = \frac{\Delta\bar{v}}{\Delta t}$$

$$\bar{F} = m\bar{a}$$

$\bar{F}_A$ → applied force

there is no such thing as "force acceleration"

Balanced forces → velocity does NOT change; there is NO acceleration

$$\bar{F}_{net} = \emptyset$$

$$\boxed{\Sigma \bar{F} = \emptyset}$$

Unbalanced forces → there is acceleration

$$\bar{F}_{net} = m\bar{a}$$

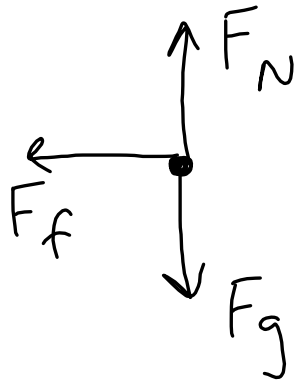
$$\boxed{\Sigma \bar{F} = m\bar{a}}$$

Picture:

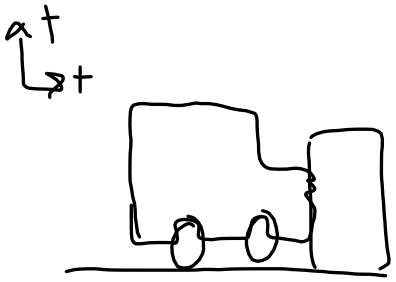
yes, friction

- just draw what is happening
- forces not needed

FBD:

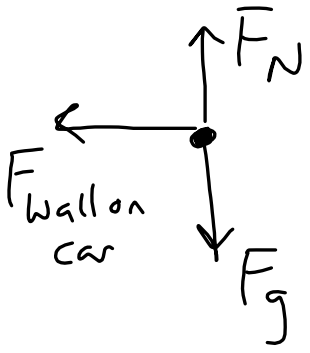


- Start with a dot
- force arrows point away from dot
- label arrows with letters



at impact

- just looking at car



Multi-Step Problems:

1) $D = \frac{m}{V}$

$m = DV$

$= (0.939 g/cm^3)(185 cm^3)$

$= 172.05 g$

$= 0.17205 kg$

$D = 0.939 g/cm^3$

$V = 185 cm^3$

$F = 9.5 N$

$a = ?$

$m = \_\_\_\_$

$F = ma$

$a = \frac{F}{m}$

$= \frac{9.5 N}{0.17205 kg}$

$= 55.22 m/s^2$

3) $F = ma$

$a = 170\ m/s^2$

$F = 25\ N$

$V = 219\ cm^3$

$D = ?$

$m = \_\_\_\_$

$$m = \frac{F}{a}$$

$$= \frac{25\ N}{170\ m/s^2}$$

$$= 0.147\ kg$$

$$= 147\ g$$

$$D = \frac{m}{V}$$

$$= \frac{147\ g}{219\ cm^3}$$

$$= 0.68\ g/cm^3$$

$$D = \frac{m}{V}$$

$$= \frac{\frac{F}{a}}{V}$$

$$= \frac{F}{aV}$$

$F = ma$

$m = \frac{F}{a}$

5) $p = mv$

$= (5.51\ kg)(3.18\ m/s)$

$= 17.52\ kg \cdot m/s$

$F_g = 54\ N$

$t = 11\ s$

$d = 35\ m$

$p = ?$

$m = \_\_\_\_$

$v = \_\_\_\_$

$a_g = 9.8\ m/s^2$

$F_g = ma_g$

$m = \frac{F_g}{a_g}$

$= \frac{54\ N}{9.8\ m/s^2}$

$= 5.51\ kg$

$v = \frac{d}{t}$

$= \frac{35\ m}{11\ s}$

$= 3.18\ m/s$